CLINICAL VIGNETTE

A Case of Severe Iron Deficiency Anemia in a Toddler

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A previously healthy 14-month-old male presented for his well-child check. His diet consisted of 25-36 ounces of whole milk a day with minimal solid food intake. He also appeared pale and more irritable compared to his last well-child check. A point of care (POC) hemoglobin (Hgb) revealed a Hgb of 5.9 g/dL. Repeat venous testing demonstrated a Hgb of 4.8 g/dL, which was a drop of almost 6 g/dL from a POC Hgb of 10.7 g/dL one month prior and he was referred to the ED. In the ED, he was tachycardic to 183 with labs significant for a Hgb of 5.1 g/dL, MCV of 57.6 fL, Immature Reticulocyte Fraction of 0.9%, Iron of <10 mcg/dL, Iron Binding Capacity of 327 mcg/dL, Iron Saturation of 11%, and a Ferritin of 1 ng/mL. Hemolysis evaluation including lactate dehydrogenase, bilirubin, and haptoglobin was normal. Given these findings and a lack of any active bleeding, his presentation was consistent with severe iron deficiency anemia secondary to excessive whole milk intake and minimal solid food intake. During admission, he was transfused two count of red blood cells with an increase in Hgb to 8.8 g/dL. He was started on ferrous sulfate supplementation, and the family was educated on the need to decrease the milk content of his diet and to transition to more nutritious solid foods.

Iron deficiency is the most common nutritional deficiency in children across the world. Although the prevalence is significantly lower in the United States compared to more resource-limited countries, iron deficiency remains relatively common, affecting 6.6% to 15.2% of toddlers depending on race/ethnicity and socioeconomic status. Iron deficiency anemia is reported in 0.9% to 4.4% of toddlers, again depending on race/ethnicity and socioeconomic status,[1,2] and is associated with impaired neurocognitive development as well as increased risk of lead toxicity.[3,4] Therefore, identification of pediatric patients with iron deficiency anemia is important to improve long-term neurodevelopmental outcomes. The AAP recommends universal screening for anemia at approximately 1 year of age as well as selective screening at any age if risk factors for iron deficiency have been identified. These include a history of prematurity or low birth weight, exclusive breastfeeding beyond 4 months of age without iron supplementation, and transitioning to whole milk or other foods that do not include iron-fortified cereals or naturally iron-rich foods.[5]

This case of an unusually severe iron deficiency anemia illustrates the importance of clinical screening for anemia based on individual patient risk factors. Although this patient had undergone recommended screening for anemia at 12 months of age, selective screening was repeated at 14 months of age based on the risk factors of excessive cow's milk intake and minimal solid food intake as well as symptoms suggestive of anemia. This screening was essential to the diagnosis and treatment of severe, transfusion-requiring anemia. Toddlers in particular represent a population at risk for iron deficiency anemia. Although the introduction of iron-fortified formulas and infant foods as well as the decrease in use of cow's milk in infants has been associated with a decline in the prevalence of anemia since the 1970s,[2] toddlers typically do not eat sufficient quantities of either food to rely on this method of iron fortification.[5] Therefore this population should be monitored for adequate intake of iron-rich foods and be provided with iron supplementation as needed.

This case also emphasizes the importance of education of parents/guardians regarding the dietary iron requirements of children of different ages. At birth, healthy term infants have sufficient iron stores to last at least the first 4 months of life.[6] For infants who are exclusively breastfed, oral iron supplementation at 1 mg/kg per day should be initiated at 4 months of age until appropriate iron-rich solid foods can be introduced in the diet as breastmilk contains very little iron. For infants who are formula-fed, the iron requirements for the first 12 months of life can be met with standard infant formula and iron-fortified infant foods. In toddlers 1 to 3 years of age, the iron requirement of 7 mg/day is best met with the intake of iron-rich foods including red meats, iron-fortified cereals, iron-containing vegetables, and fruits with vitamin C, which augments the absorption of iron. If a toddler is not receiving this amount of iron, iron supplementation should be initiated with liquid supplements for children 12 to 36 months of age or with chewable multivitamins for children over 3 years of age. Most relevant to this case, cow's milk should not be introduced in the diet before 12 months of age and total intake should not exceed 24 ounces a day. This is because cow's milk intake greater than 24 ounces a day is a risk factor for iron deficiency anemia due to the low concentration and low bioavailability of iron in cow's milk as well as the tendency for large volumes of cow's milk to replace the intake of other iron-rich foods.[5] The case presented here exemplifies that these factors can act in combination to result in a severe iron deficiency anemia and also provides an important reminder that ensuring sufficient dietary intake of iron is essential to preventing the development and potential long-term consequences of iron deficiency anemia.

REFERENCES

1. Centers for Disease Control and Prevention, National Center for Health Statistics. National Health and Nutrition Examination Survey. Available at: www.cdc.gov/nchs/nhanes.htm.
2. **Cusick SE, Mei Z, Freedman DS, Looker AC, Ogden CL, Gunter E, Cogswell ME**. Unexplained decline in the prevalence of anemia among US children and women between 1988-1994 and 1999-2002. *Am J Clin Nutr*. 2008 Dec;88(6):1611-7. doi: 10.3945/ajcn.2008.25926. PMID: 19064522.
3. **Lozoff B, Jimenez E, Hagen J, Mollen E, Wolf AW**. Poorer behavioral and developmental outcome more than 10 years after treatment for iron deficiency in infancy. *Pediatrics*. 2000 Apr;105(4):E51. doi: 10.1542/peds.105.4.e51. PMID: 10742372.
4. **Wright RO, Shannon MW, Wright RJ, Hu H**. Association between iron deficiency and low-level lead poisoning in an urban primary care clinic. *Am J Public Health*. 1999 Jul;89(7):1049-53. doi: 10.2105/ajph.89.7.1049. PMID: 10394314; PMCID: PMC1508857.
5. **Baker RD, Greer FR; Committee on Nutrition American Academy of Pediatrics**. Diagnosis and prevention of iron deficiency and iron-deficiency anemia in infants and young children (0-3 years of age). *Pediatrics*. 2010 Nov;126(5):1040-50. doi: 10.1542/peds.2010-2576. Epub 2010 Oct 5. PMID: 20923825.
6. **Suskind RM, Lewinter-Suskind L, Dallman PR**. Nutritional anemias in childhood: iron, folate, and vitamin B12. In: Suskind RM, Lewinter-Suskind L, eds. *Textbook of Pediatric Nutrition*. 2nd ed. New York, NY: Raven Press; 1993:91-105.